Table of Contents

Introduction 1
How Your MFJ-662 Simplex Repeater Works 1
Jacks and Controls 2
Specifications 2
Power Sources 3
Interface Connections 4
Set-up Testing and Operation 4
Selecting a PTT Interface 6
Record Level 6
Transmit Level 7
Simplex Repeater Operating Tips 7
Repeater Set-Up Suggestions 8
Theory of Operation 9
In Case of Difficulty 9
Technical Assistance 10
Schematic 11

INTRODUCTION

Congratulations on purchasing the MFJ-662 Simplex Pocket Repeater. This small unit houses everything you need to turn your HT, mobile, or base-station radio into a range-extending simplex repeater system. The MFJ-662 may be small, but it's loaded with high-tech features:

32-Second Memory: Captures your entire message with time to spare.

PIC Controller: Reliable PIC technology manages each function flawlessly.

Adjustable Gain: Programmable transmit level ensures best audio quality.

Selectable PTT Interface: Keys load-sensing or ground-contact PTT circuits.

Small Size: Ultra-compact pocket-sized case fits anywhere.

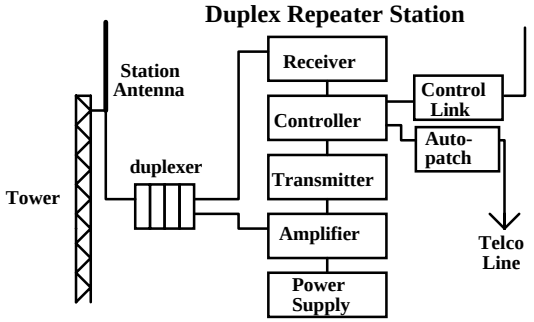
Flexible Power: Uses single 9V battery or any external 9-15 Vdc source.

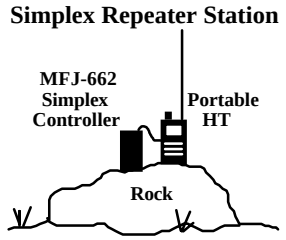
Versatile Interface: Open-ended patch cable adapts to virtually any radio.

Courtesy Tone: Controller signals the end of repeated messages.

HOW YOUR MFJ-662 SIMPLEX REPEATER WORKS

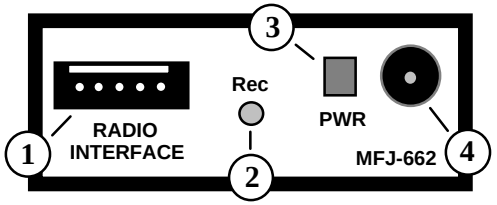
Repeater stations extend communication range beyond line-of-sight by intercepting and re-transmitting signals from a favorable location. Repeaters may be either duplex or simplex in design. Most Hams are more familiar with the sophisticated duplex systems set up by repeater groups to expand mobile communication. These repeaters occupy two channels, one for listening and one for simultaneously re-transmitting. Duplexing offers the convenience of real-time conversation, but the hardware is generally too large and complex to move around for portable use.





Unlike duplex systems, simplex repeaters require only a portable transceiver and a self-powered controller such as your MFJ-662. They occupy a single channel and use solid-state voice-memory to record and then repeat each incoming transmission. Simplex repeaters are especially useful for increasing the range of hand-held HTs and mobile units participating in field activities such as races, missing-person searches, hunting trips, disaster communication, and special events. All you need is an accessible elevated location and a minute or two of time to place your repeater in service.

JACKS AND CONTROLS



1. **Interface Jack:** Accepts 5-pin IDC plug for Mic, Record Audio, PTT lines and ground.
2. **Record Indicator:** LED illuminates when controller is recording.
3. **Power Off/On:** Applies power to controller from internal battery or external jack.
4. **External Power:** Accepts 2.1-mm plug (9-15 Vdc source), disconnects battery.

SPECIFICATIONS

Power Source ..... 9V battery or 9-15 Vdc supply

Current Drain ..... 3.5 mA Standby

PTT Mode ..... Selectable (ground-contact or load-sensing)

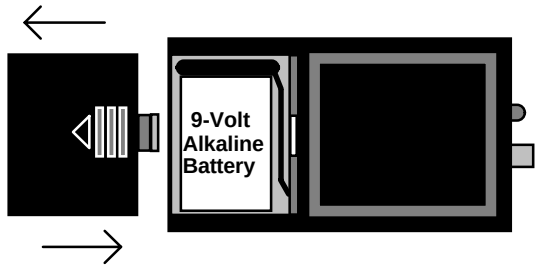
Voice Memory ..... 32 Seconds total storage

Dimensions ..... 2.3" x 1" x 3.7"

Weight ..... ≈2 oz.

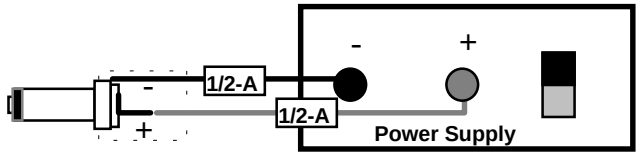
POWER SOURCES

1. Internal Power: Use a fresh premium-grade alkaline 9 volt battery. To install, remove the compartment cover by pressing in and sliding downward with your thumb (see below). Locate the battery snap-clip inside and connect it to the battery terminals. Place battery inside and reinstall the lid.



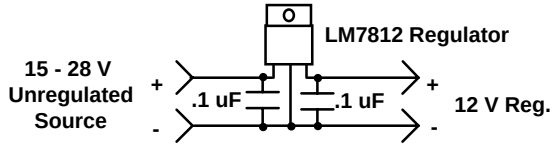
Important Note: Never store your controller for extended periods with the battery installed. Leakage and corrosion could damage your unit.

2. External Supply: Power from any well-filtered 9-15 Vdc source--including 13.8 volt station supplies, 12 volt automotive systems, or external battery packs. Protect both power leads with ½ Amp fuses when using high-current sources. The controller's external power jack accepts a 5.5mm x 2.1mm coaxial plug. You may obtain extra plugs from RadioShack (274-1567 or equivalent). Wire (+) voltage to center terminal, and (-) to common, as shown below.



Important Note: Unregulated DC sources (simple wall cubes, solar panels, etc.) may damage your controller. Never apply more than 20 volts to your unit.

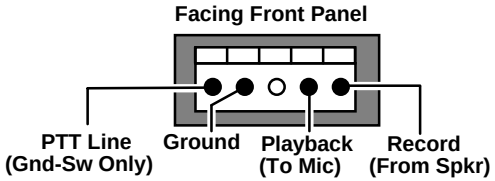
To power from an unregulated source, use a simple regulator circuit such as the one shown in the following diagram.



3. MFJ-1312B: Power your controller directly from AC mains using the MFJ-1312B 9 volt power supply. This comes with a 2.1mm plug pre-installed, and is available from MFJ Enterprises, Inc. or a MFJ dealer.

INTERFACE CONNECTIONS

A 5 pin IDC jack on the front panel of the MFJ-662 provides access to the interface lines for your radio. Use the supplied IDC plug and open-ended patch cord to prepare an interface cable. A front-panel view of the IDC connector's pin-out is shown below:



PTT Line: FET switch pulls PTT line to ground in **MBL** (mobile) mode.

Ground: Common return for PTT, microphone, and speaker line.

Playback: Sends mic-level audio to radio, provides PTT sense-load in **HT** mode.

Record: Terminates radio's speaker line, samples off-air audio for recording.

See your radio's instruction manual for pin-out connections at the transceiver end. Many popular connectors, including 8-pin mic plugs and mini-plugs, are available from Radio Shack, Ham stores, or MFJ. You may also purchase an interface cable terminated for Kenwood, Yaesu, Alinco, or Radio Shack transceivers directly from MFJ for $15.95.

SET-UP TESTING AND OPERATION

For initial controller set-up, use a second "test" radio tuned to the desired operating channel (a HT set for low RF-output is a good choice). This will be used to check the controller's operating functions and playback level.

1. **Set Receiver Volume and Squelch:** Turn on the repeater radio and set its *Volume* control for a low but comfortable listening level through the speaker (this step establishes the controller's record level). Set the *Squelch* to quiet FM background noise.

2. **Connect the Controller:** Plug the controller's patch cable into the repeater radio. The *Rec-Aud* line goes to the radio's *External Speaker* jack, and the *Mic-Audio/PTT line(s)* go to the radio's *Microphone* jack. Make sure the controller is set up for your radio's PTT circuit (see *PTT-Interface* section on the next page).

3. **Record A Test Transmission:** Turn the controller *On.* Key the test radio, pause for 1 second, then send a short test transmission by speaking normally into the microphone.

The controller's *Rec* LED should illuminate, indicating the controller is detecting the test signal and capturing your message. Keep the test transmission under the 32 second record time limit. When finished, unkey the test radio and listen for playback. The controller's *Rec* LED should go out and the repeater radio should switch into transmit mode and return your message.

4. **Check Playback Level:** Speech should sound natural and modulation should match other off-air signals (3-5 kHz peak deviation). If audio is "thin" and weak, or if it is "mushy" and distorted, refer to the *Transmit Level* section of this manual. You will need to adjust the controller's playback level.

5. **Courtesy Tone:** At the end of each message playback, the controller will insert an audible "beep" before unkeying the transmitter. This tone indicates the repeater has finished repeating the current message and is ready to receive the next message.

6. **Test Mode:** The MFJ-662 has a built-in test function to report status information from its PIC controller (model number, software version, etc). To activate this function:

   (a.) Turn off your controller.

   (b.) Open the radio's squelch.

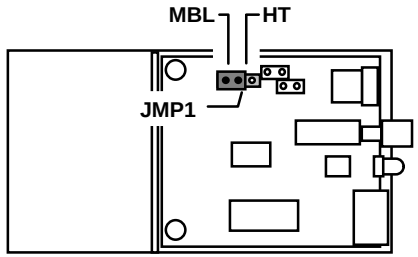
   (c.) Turn the controller back on.

The repeater should switch to transmit and send a stored CW message, simultaneously flashing the *Rec* LED and keying the courtesy tone oscillator. This message provides an indication that the PIC is working properly.

If your repeater performs normally and levels are set properly, then it's ready for set-up and operation in the field. If it fails to function normally, refer to the set-up section below--and to the *In Case of Difficulty* section at the end of the of the manual.

SELECTING A PTT INTERFACE

The MFJ-662 works with transceivers using load-sensing or ground-contact PTT circuits. Internal jumper **JMP1** selects switching mode. JMP1 is normally pre-set at the factory for load-sensing radios. To change modes, remove the controller's two case screws and gently separate the case halves. On the pc board, locate JMP1, a 3-pin header.



At JMP1, set the jumper plug for the type of PTT keying used by your radio:

MBL: For mobile or base radios using ground-contact PTT switching.

HT: For HTs or other radios using load-sensing PTT switching.

Note that ground-contact switching uses a separate PTT line, while load-sensing combines the mic and PTT lines together. If you don't know which type of activation your radio requires, consult its operating manual for specifics. This information is often found under RTTY/Packet set-up instructions, or on the microphone connector pin-out diagram.

RECORD LEVEL

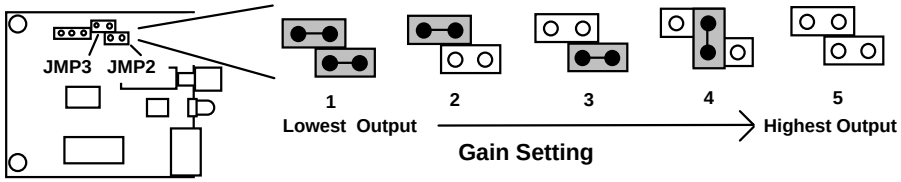
Set up your controller's off-air record level with the transceiver's *Volume* control. To adjust, set *Volume* for a low but comfortable listening level for off-air signals while listening through the radio's built-in speaker (as described in *Operating Instructions*). Each time you use the repeater, remember to return the volume control to the same approximate setting. This is important because *any radical change in the volume setting will be reflected in the voice-recorder's playback level*. This, in turn, could upset the modulation level of your re-transmitted signal.

IMPORTANT WARNING: NEVER ADJUST TRANSCEIVER VOLUME WITH THE SPEAKER CUT OFF. THIS COULD RESULT IN OVERDRIVING THE RECORDER IC--AND MAY EVEN DAMAGE THE CONTROLLER'S INTERNAL LOAD RESISTOR.

TRANSMIT LEVEL

Before attempting to set up the controller's transmit level, make certain the transceiver's *Volume* control is set correctly (see paragraph above). To adjust transmit level, use a second test radio to monitor the repeater's on-air signal quality (see *Operating Instructions*). For more a percise signal evaluation, you may also use a FM deviation meter or FM service monitor.

The MFJ-662 has four (4) transmit-level settings to accommodate a wide range of transceiver speech-amplifier circuits. Levels are selected by positioning jumper-plugs on headers **JMP2** and **JMP3** (illustrated below)**.** If the repeated audio is too weak, increase it by moving jumpers for a higher drive level. If audio level is too strong (mushy or bassy), set the jumpers for a lower audio output level. Your objective is to obtain the most natural playback quality possible for normal on-air signals (ie. incoming signals with 3-5 kHz peak FM deviation).



If there's an unused jumper plug, install it on any free header pin to prevent it from becoming misplaced.

IMPORTANT WARNING: NEVER ATTEMPT TO INCREASE TRANSMIT LEVEL BY TURNING UP YOUR TRANSCEIVER'S VOLUME CONTROL WITH THE SPEAKER CUT OFF.

SIMPLEX REPEATER OPERATING TIPS

Pick-Up Time: After keying the mic, pause a second before speaking (if you speak immediately, the controller may "clip" a portion of your first word).

Drop Time: Wait for the "beep" before transmitting your reply.

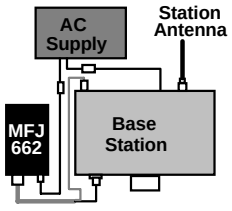
Message Capacity: Message capacity is 32 seconds. In practice, simplex repeater users usually keep transmissions much shorter to minimize wait-time.

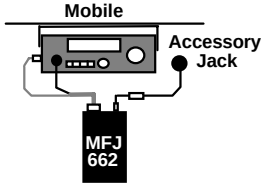
Message Overflow: When a incoming transmission overflows the 32-second memory, the controller automatically replays what's been recorded. This protocol keeps information moving, and also provides a measure of protection against an unwanted signal locking up the controller.

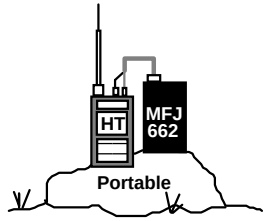
ID-ing: Remember to voice-ID your repeater in compliance with FCC guidelines. You may do this in the course of normal conversation.

REPEATER SET-UP SUGGESTIONS

Your MFJ-662 may be set up for base, mobile, or portable operation. Here are some suggestions to help you get the best performance from your simplex repeater:







Operating Environment: When leaving your repeater at an unattended site, always protect it from direct exposure to sun, rain, snow, and extreme temperatures.

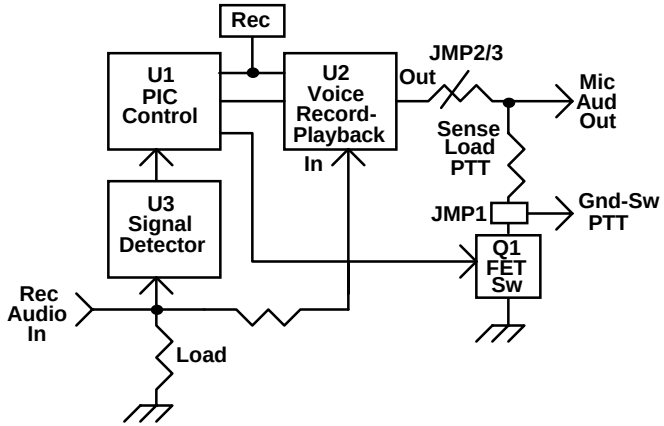
Frequency: Whenever possible, avoid using popular simplex frequencies where your repeater might interfere with out-of-area communication.

Power: Run only as much power as needed for the coverage area. High power wastes battery time and may draw unwelcome attention from out-of-area stations.

Location: Position your repeater in an accessible location. In the event of a malfunction or intentional jamming, you may need to go there and shut it down quickly.

Security: Always secure the site. Leaving a repeater exposed and unattended in a highly-public open area invites tampering, vandalism, unauthorized use, or theft.

THEORY OF OPERATION



Speaker level audio is routed from the repeater transceiver's AF-output stage to a 10 ohm resistive load in the controller. An audio sample is passed to signal-detector U3--where it is amplified and used to cue PIC-controller U1 when a incoming signal is present. When a signal is detected, U1 activates voice-recorder-IC U2's record mode and illuminates the *Rec* LED. At the same time, a second un-amplified audio sample is passed to the input line of U2 for recording.

When the incoming signal drops, or when U2's memory overflows, controller U1 turns off the *Rec* LED and cues U2 to enter playback mode. It also activates Q1--providing PTT closure to the transceiver to initiate a transmission (ground-closure or load-sensing PTT selected at JMP1). Playback audio is then routed from U2 to the transceiver's mic line through transmit-level attenuator JMP2/3. When message playback is complete, U1 injects a courtesy "beep" onto the mic line and turns off Q1--dropping the transmitter's PTT circuit. This terminates the repeater's record/playback cycle and places the controller in standby mode to await the next message.

IN CASE OF DIFFICULTY

Won't Power Up: Check battery condition or external power supply connections.

Won't Activate Transmitter: Check PTT wiring, PTT jumper JMP1.

Weak Transmit Audio: Check volume setting, adjust Transmit Level JMP2/3.

Distorted Transmit Audio: Check volume setting, adjust Transmit Level JMP2/3.

Won't Record Off-air: Check record-audio line from external speaker jack.

Records, No Transmit Audio: Check playback-audio line to mic jack.

Other Problems: Run "Test Mode" to see if controller responds.

TECHNICAL ASSISTANCE

If you have any problem with this unit first check the appropriate section of this manual. If the manual does not reference your problem or your problem is not solved by reading the manual you may call *MFJ Technical Service* at **662-323-0549** or the *MFJ Factory* at **662-323-5869**. You will be best helped if you have your unit, manual and all information on your station handy so you can answer any questions the technicians may ask.

You can also send questions by mail to MFJ Enterprises, Inc., 300 Industrial Park Road, Starkville, MS 39759; by Facsimile to 662-323-6551; or by email to techinfo@mfjenterprises.com. Send a complete description of your problem, an explanation of exactly how you are using your unit, and a complete description of your station.

SCHEMATIC